REMARKS

This Amendment is in response to the Office action mailed October 14, 2009. A petition for three-month extension of time, with payment (by credit card authorization) for the requisite fees, are submitted herewith. In the event any additional fees are necessary, kindly charge the cost thereof to our Deposit Account No. 13-2855.

Status of the Claims

Claims 1-30 are pending in the present application. Claims 1-13 and 21-29 are withdrawn. Claims 14 and 15 are amended, as discussed in more detail below. No new matter is added by these amendments.

Response to Rejections Under 35 U.S.C. § 102

Claims 14-18 and 30 stand rejected under 35 U.S.C § 102(b) for allegedly being anticipated by Dixon, WO 00/38928 ("Dixon"). Claims 14 and 15 are currently amended so as to still more clearly distinguish from the prior art made of record. Specifically, claim 14 is amended to recite "an inlet manifold having a length extending in the array direction and communicating with the plenum chamber through an element providing a resistance to a fluid so as to cause a drop in the pressure of fluid traveling across said element; there being, in use, a flow of fluid from the inlet manifold through the plenum chamber to the ejection chambers, there being a substantial net flow in the array direction in the inlet manifold, wherein the drop in fluid pressure across said element is greater than the total fluid pressure drop along the length of said inlet manifold so as to ensure substantially no net flow in the array direction in the plenum chamber" and claim 15 is amended to recite "an outlet manifold having a length extending in the array direction and communicating with the same or a different plenum chamber through the same or a different element providing a resistance to a fluid so as to cause a further drop in fluid pressure, wherein said further drop in fluid pressure is greater than the total fluid pressure drop along the length of said outlet manifold."

Basis for the amendments to claims 14 and 15 may be found in the published PCT specification at page 4, lines 19 to 26. Therefore, for at least this reason it is respectfully submitted that no new matter has been added by way of the amendments now made to claims 14 and 15.

The Disclosure of Dixon

Before specifically addressing the patentability of the currently amended claims, the Applicant (having substantial knowledge of the constructions disclosed in Dixon) wishes to address in general terms the manner of operation of Dixon, in particular the flow patterns established during use.

As noted in the Office action mailed October 14, 2009, fluid in the inlet (220) and outlet (210, 230) manifolds flows in a direction parallel (or anti-parallel) to direction 100, as is displayed in Figures 2 and 3. Turning now to Figure 5, there is illustrated a cover component 620 that is formed with a number of ports 630, 640, 650 (illustrated in cross-section) so as to provide communication between fluid chambers 600, 610, and the aforementioned manifolds 210, 220, 230. It should be noted that direction 100 is orientated into the paper in the cross-sectional view of Figure 5 of Dixon.

Turning to the fluid chambers, a plurality of elongate channels 11 are formed in a piezoelectric base component 860. A break 810 in the electrode within each channel 11 allows the two halves 600, 610 of each channel to operate independently as two fluid chambers, thus providing two rows of fluid chambers.

The two channel lengths 600, 610 are supplied with fluid entering from inlet manifold 220 through inlet port 640 (this fluid moves upwards as seen in Figure 5 of Dixon), with approximately half of the fluid flowing along the channel length 600 and being removed to outlet manifold 210 via outlet port 630, and the remaining fluid flowing along channel length 610 and being removed to outlet manifold 230 via outlet port 650.

During fluid ejection, one of the channel lengths 600 or 610 may be actuated so that fluid is ejected through a respective nozzle 870, or 880, via a respective opening 840, or 850. Thus, each individual channel length communicates with only one opening and one nozzle (for example, length 600 communicates with nozzle 870 via opening 840).
The construction includes a plurality of such channels, disposed in parallel, with each channel providing two nozzles spaced apart along the length of that channel. In this way, the construction provides two parallel rows of individually addressable channel lengths, with two respective parallel rows of nozzles 20, 30. These parallel rows of nozzles are spaced apart in the direction in which each channel has its length.

As the two rows of nozzles 20, 30 are clearly displayed in Figure 2, the figure aids in understanding the relationship between the direction in which each channel has its length,

and the direction 100 in which fluid flows along the inlet manifold. In the annotated figure below, which is based on Figure 2 of Dixon (with the dashed directional arrow "L" added for purposes of these Remarks), the direction in which the nozzles rows 20, 30 are spaced apart, which is also the direction in which each channel has its length, is identified as (L).

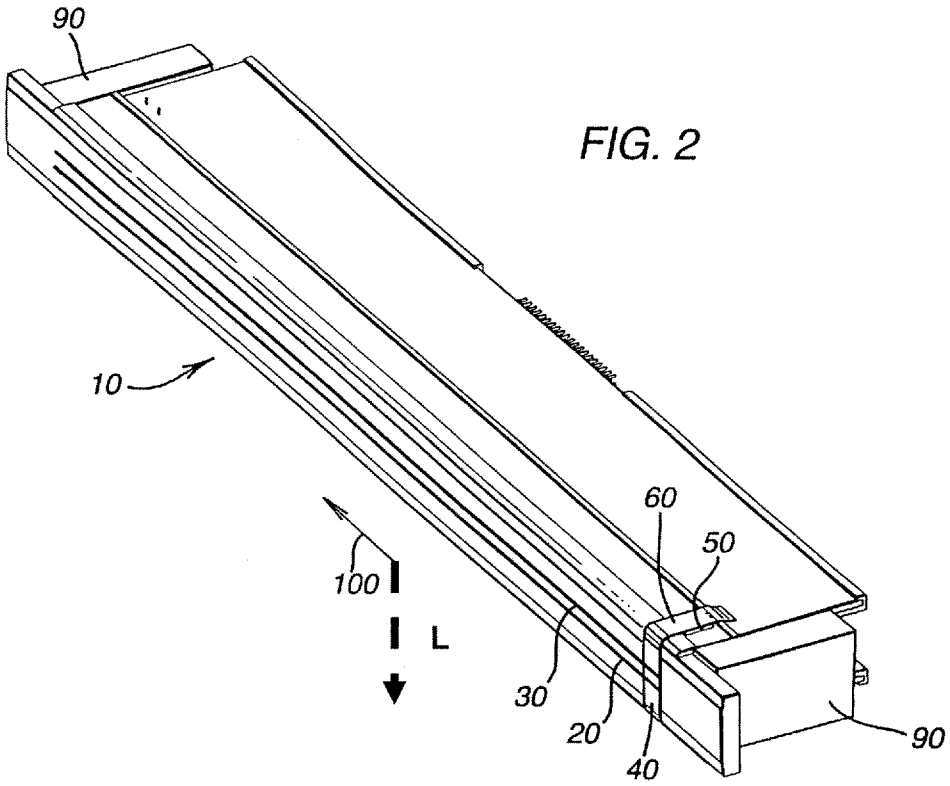

FIG. 2

In the following figure, which is based on Figure 5 of Dixon, the same direction L (with the dashed directional arrow "L" having been added for purposes of these Remarks) is also marked. As noted above, in this cross-sectional view, the direction 100 is orientated into the page.

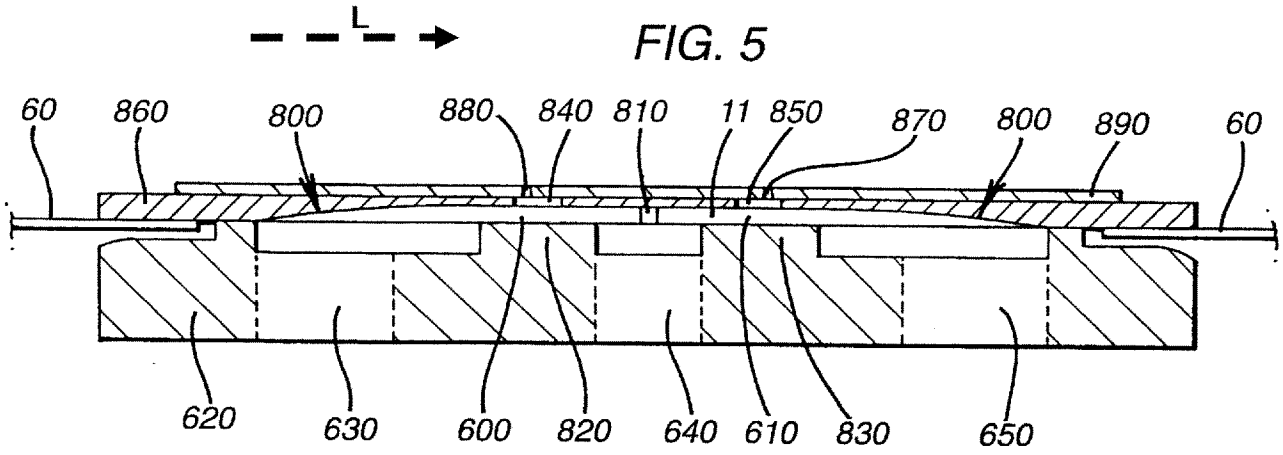

FIG. 5

Arguments from Office action Regarding Dixon

The Applicant most respectfully submits that the analysis of Dixon provided in the Office action mailed October 14, 2009 is flawed. In particular, the identification in the Office action of element 11 with the claimed "plenum chamber" is logically inconsistent with the identification of direction 100 with the claimed "array direction". For at least this reason, it is respectfully submitted that a finding of anticipation cannot be sustained.

First, it is considered instructive to consider the language of claim 14 with regard to the fluid flow: The Applicants' claim 14 recites "in use, a flow of fluid from the inlet manifold through the plenum chamber to the ejection chambers". Therefore, the claimed "ejection chambers" must receive fluid from the claimed "plenum chamber".

In the Office action, element 11 is identified as corresponding to the claimed "plenum chamber". Thus, so as to conform to the language of the claim, only elements receiving fluid from element 11 may be considered as the claimed "ejection chambers".

As is clear from the discussion of Dixon above, the two openings 840 and 850 receive fluid from element 11, and thus the identification in the Office action of these openings as corresponding to the "ejection chambers" recited in the present claims is consistent in this regard.

Claim 14 further recites that the "ejection chambers" are spaced apart in the "array direction". As is clear from the annotated figure from Dixon above, elements 840 and 850 are spaced apart in direction "L". This would suggest that direction "L" may be identified with the claimed "array direction". However, the Office action has already identified direction 100 as corresponding to the recited "array direction".

As noted above, direction 100 is in fact normal, or perpendicular to, direction "L". Therefore, either the Office action's identification of the "array direction" is incorrect, or the identification of the "ejection chambers" is incorrect. In either case, the rejection is inconsistent and therefore cannot support a finding of anticipation of claim 14.

Alleged Anticipation by Dixon

It is believed that the Office action has identified direction 100 with the claimed "array direction", so as to be consistent with the identification of element 220 with the claimed "inlet manifold", since the claim recites that there is "a substantial net flow in the array direction in the inlet manifold". Dixon does indeed teach a flow along the inlet manifold 220 in direction 100. As previously discussed, Dixon also teaches the flow of fluid from this inlet manifold, through ports formed in a cover component 620, to two parallel rows of fluid chambers. However, Dixon does not teach that this inlet manifold 220 communicates with a "plenum chamber through an element providing a resistance to a fluid", "wherein the drop in fluid pressure across said element is greater than the total fluid pressure drop along the length of said inlet manifold". For at least this reason, it is most respectfully submitted that claim 14 is not anticipated by Dixon.

Further, as Dixon does not teach these features, it cannot offer the claimed advantage of a plenum chamber having substantially no net flow in the array direction.

Advantages Over Dixon

In fact, Dixon suffers from exactly the problems that the present invention seeks to ameliorate: Tthe Applicants have found that, in constructions such as Dixon, the flow of fluid along the inlet manifold 220 in direction 100 may cause pressure differences along the length of the inlet manifold. These differences in pressure may cause differences in ejection effects between fluid chambers in the array.

This pressure drop over the length of the inlet manifold is discussed at Page 15, lines 14 to 21 of Dixon, but it is proposed by the document to use manifolds and flow rates large enough that the pressure drops "did not exceed that level at which difference in the image quality between successive channels became significant" (Page 15, lines 26 to 27). Indeed, it should be noted in passing that the problems associated with such pressure losses along the length of the inlet manifold are referred to in a passage cited in the Office action: Page 13, lines 12-21. It is respectfully submitted that this passage has been misquoted in the Office action as referring to pressure losses "along the length of the

chamber", when the cited passage of Dixon in fact refers to pressures losses "along the length of the chamber array" (emphasis added), in other words, pressure losses along the length of inlet manifold (as opposed to along the length of the chamber).

The Applicants, recognizing that the approach taken in Dixon involves the use of large volumes of ink in the manifolds (as is noted at [0083] of the present application), instead provides an arrangement where a plenum chamber communicates with the inlet manifold through "an element providing a resistance to a fluid", with the level of this resistance chosen so that "the drop in fluid pressure across said element is greater than the total fluid pressure drop along the length of said inlet manifold".

Thus, according claim 14, while there is a substantial net flow in the array direction in the inlet manifold, this element ensures that there is substantially no net flow in the array direction in the plenum chamber. This has the advantage that successive ejection chambers in the array have little, if any, difference in droplet ejection.

Therefore, although Dixon may be seen as addressing similar issues with variation in droplet ejection along the length of an array of ejection chambers, Dixon proposes an alternative solution to the present invention, which is to ensure a high rate of flow through the chambers with the drawback that large volumes of ink must be used in the manifolds. The claims of the present application provide an alternative manner in which to address these problems that is neither taught nor suggested by Dixon, and may enable smaller volumes of fluid to be used. For at least this reason it is most respectfully submitted that claims 14-18 and 30 are patentable over Dixon.

Response to Rejections Under 35 U.S.C. § 103

Claims 19 and 20 are rejected as allegedly unpatentable over Dixon in view of Hirota, US 2002/0180827 A1. As conceded in the Office action, Dixon does not disclose (as to claim 19) said element is formed of porous material and extends in the array direction; and (with respect to claim 20) the porosity of said element varies in the array direction. For the reasons discussed above, claims 14 and 15, as amended, are believed to be allowable over Dixon. For at least these reasons, it is respectfully submitted that even if Dixon were combined with or modified according to Hirota, the result would not satisfy the language of claims 19 or 20. These claims are therefore respectfully submitted to be in condition for allowance, and withdrawal of the rejections is requested.

Conclusion

It is respectfully submitted that claim 14, as amended, is patentably distinguishable from Dixon, WO 00/38928. For the reasons discussed in these Remarks, it is respectfully submitted that claim 14, and all claims depending therefrom, are in condition for allowance. The Examiner's favorable reconsideration is respectfully solicited. If the Examiner has any questions that might easily be resolved by telephone, the Examiner is invited to contact the Applicants' undersigned representative at (312) 474-6300.

Date: April 14, 2010

Respectfully submitted,

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